

whole heavens a brilliant glow of light. It was apparently some three feet in diameter and left behind it a long fiery train of different colored sparks." Southington, Conn., 2nd; Lyndon, Ill., 12th, 15th; New Corydon, Ind., 10th, 12th, 13th, 15th, 19th, 24th; Monticello, Ia., 6th; Yates Center, Kan., 5th, 7th; Woodstock, Md., 3rd, 10th, 16th, 24th, 29th, 31st; Rowe, Mass., 1st, 2nd, 15th; Fall River, Mass., 31st; Fayette, Miss., 3rd, 10th; Ashley, Miss., 17th; Clear Creek, Neb., 3rd, 31st; Genca, Neb., 7th; Grafton, N. H., 21st; Freehold, N. J., 17th, 31st; Waterburg, N. Y., 2nd, 10th, 13th; Starkey, N. Y., 16th; Jacksonburg, Ohio, 18th; Los Angeles, Cal., 8th; Dodge City, 9th; Davis, Tex., 8th; Mobile, Ala., 30th; Pensacola, Fla., 10th; Milwaukee, Wis., 6th.

Earthquakes.—Key West, 22nd, 11:10 p. m., "severe shock passed over the island, lasting one minute; a rocking motion, from southwest to northeast, was felt by many persons in the upper stories of buildings along a path not more than 100 yards wide; vessels in the harbor did not feel the shock, and no noise accompanied it." Havana, Cuba, 22nd, 11:04 p. m., "light shock of ten seconds duration, three oscillations from southeast to northeast; 23rd, 3:45 p. m., another light shock of less duration; 26th, at about 5 a. m., still another shock was experienced by many persons; in the western portion of the island shocks have been generally felt for several days, accompanied with continued subterraneous thunder or roaring; the boroughs of San Cristobal and Candelaria are in ruins, and several persons killed, wounded and contused; on the night of the 29th, four light shocks were felt at San Cristobal. On the Isle of Pines, 22nd, shock at 11 p. m.; 23rd, at 4 a. m. and 9 p. m.; 26th, at 4:30 p. m. and 1 p. m." San Salvador, C. A., 22nd, "violent shocks were felt in the interior: much damage is reported from Libertas; the earth at this place seemed literally to be dancing; persons were thrown to the ground and many buildings suffered; the lake of Ilopango was in motion like a boiling cauldron, emitting dense sulphurous vapors; industries of all kinds suspended." In California on the 9th "at Hollister, San Benito county, about 6 a. m., heaviest earthquake shock ever felt here; vibrations from N.E. to S.W. continued over twenty seconds; Gonzales, Monterey county, 5:45 a. m., quite a perceptible shock felt; Santa Cruz, Santa Cruz county, 5:45 a. m., shock from N to S., lasting from fifteen to twenty seconds." Yokohama, Japan, December 3rd, 1879, 7:09 a. m., severe shock; duration, 20 seconds; at 9:45 a. m., light shock; 7th, 5:10 a. m., light shock; 11 a. m., light shock.

Polar Bands.—New Corydon, Ind., 1st, 13th, 15th, 17th, 24th, 26th, 27th, 31st; Guttenburg, Iowa, 28th; Glenwood, Iowa, 4th, 11th, 19th; Yate's Center, Kan., 11th; Gardiner, Me., 15th, 28th; Thornville, Mich., 4th, 24th; Clear Creek, Neb., 4th, 5th, 8th, 10th, 11th, 14th, 15th, 16th, 18th, 19th, 20th, 23rd, 25th; Auburn, N. H., 15th, 26th; Vineland, N. J., 21st, 26th; Wytheville, Va., 24th, 25th, 26th, 28th; Toledo, 24th; Barnegat, N. J., 28th; Atlantic City, N. J., 28th.

Prairie and Forest Fires.—Morriston, Dak., 18th; Ft. Dodge, Kan., 13th to 19th; Glenwood, Ia., 16th; Creswell, Kan., 5th, 8th, 9th, 11th, 14th, 15th, 18th to 22nd, 25th, 27th, 28th, 30th; Independence, Kan., 9th, to 29th; Wellington, Kan., 23rd; Lake Charles, La., 24th; North Platte, 10th; Deadwood, Dak., 8th; Ft. Gibson, Ind. Ty., 9th, 11th, 12th, 14th, 16th; Henrietta, Tex., 11th, 16th, 17th.

Sun Spots.—The following record of observations made by Mr. D. P. Todd, Assistant, N. A. O., has been forwarded by Prof. S. Newcomb, U. S. Navy, Superintendent Nautical Almanac Office, Washington, D. C.:

DATE— Jan., 1880.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		REMARKS.
	Groups	Spots.	Groups	Spots.	Groups	Spots.	Groups	Spots.	
1st, 12 m.....	1	2	0	0	0	0	1	2	Spots small.
1st, 3 p. m....	0	0	0	0	0	0	1	2	
4th, 1 p. m....	3	22	0	0	3	22	4	24	Faculae; many of the spots small. The new spots probably reappeared by solar rotation.
8th, 2 p. m....	0	0	2	8	0	0	2	16	
10th, 8 a. m....	0	0	0	0	0	0	2	24	A few of the spots very large.
10th, 3 p. m....	1	2	0	0	0	0	3	26*	
13th, 9 a. m....	0	0	0	0	0	0	3	26*	Faculae.
14th, 9 a. m....	1	4	0	0	0	0	4	30*	
14th, 4 p. m....	0	0	1	4	0	0	3	26*	Faculae.
15th, 3 p. m....	1	4	1	10	1	4	3	26*	
18th, 10 a. m....	0	0	1	10	0	0	2	10	Faculae.
18th, 4 p. m....	0	0	0	0	0	0	2	10	
19th, 9 a. m....	0	0	0	3	0	0	2	7	Faculae.
21st, 9 a. m....	0	0	1	5	0	0	1	2	
23th, 9 a. m....	0	0	1	2	0	0	0	0	Faculae.
24th, 2 p. m....	0	0	0	0	0	0	0	0	
25th, 5 p. m....	0	0	0	0	0	0	0	0	Several groups of faculae.
26th, 9 a. m....	1	3	0	0	0	0	1	3	
28th, 9 a. m....	1	1	0	0	0	0	2	4	Faculae.
28th, 5 p. m....	0	0	0	0	0	0	2	4	
29th, 9 a. m....	0	0	0	0	0	0	0	0	Faculae.
31st, 4 p. m....	2	9	0	0	?	?	2	9	

*Approximated.

NOTES AND EXTRACTS.

Generation of Cyclones.—In an elaborate report upon the Madras Cyclone of May 1877, Mr. J. Eliot gives the following general conclusions relating to cyclone generation in the Bay of Bengal:

1. Cyclonic disturbances of small intensity are of frequent occurrence during the prevalence of the southwest monsoon or rainy season. Cyclones, or revolving storms of great extent and intensity, occur only at the two transitional periods, viz., at the April transitional period preceding the southwest monsoon, and the October transition period succeeding the southwest monsoon, and ushering in the north-east monsoon.
2. Cyclone occurrence is most probable during the October transition period.

3. The most intense and extensive cyclones occur during the October transition period.
4. The most powerful cyclones in the Bay tend to occur at or about the minimum sun-spot period.
5. Cyclones formed at the commencement of the April transition period, or near the end of the October transition period, are usually generated in the south of the Bay, and proceed towards the Coromandel coast.
6. Cyclones generated during the latter part of the April transition period, or the greater part of the October transition period (*i. e.*, to the end of October,) usually take their origin in the centre of the Bay to the west or north-west of the Andamans, and advance towards the coast of Ganjam, Orissa or Bengal.
7. There is a strong antecedent probability, derived from past experience, of the occurrence of at least one intense cyclone at each minimum sun-spot period.
8. The invariable antecedents of powerful cyclones at the two transition periods are—approximate uniformity of pressure over and round the coast of the Bay of Bengal, light and variable winds or calms over a considerable portion of the Bay, and little or no rainfall over the coast region as well as in the Bay; the weather is hence sultry; the sea smooth. The amount of aqueous vapour accumulates, and finally gives rise to peculiar sky effects.* The immediate antecedent is heavy rainfall, concentrated over a portion of the Bay, accompanied by strong indraught, most marked from the Indian Ocean at the entrance of the Bay. This indraught from the Indian Ocean gives rise to strong winds and heavy rain at the stations on the south and west coasts of Ceylon.
9. The direction of progression of the cyclonic vortex when it is fully developed, varies according to the antecedent meteorological conditions of the Bay from west to north-east.
10. Cyclones at sea (*i. e.*, cyclonic vortices) advance in approximately straight lines over the sea area.
11. The part of the coast struck by the cyclonic vortex is previously indicated as a rule (but not invariably) by a more rapid fall of the barometer than at the neighbouring coast stations.
12. The path of a cyclonic vortex at the two transitional periods appears to coincide closely, if not exactly, with the line of least atmospheric motion immediately previous to the origin and development of the cyclone.
13. The intense motion of a cyclonic vortex is confined almost entirely to the lower atmospheric strata. The plane of saturation is very probably at no great height. In no case has any cyclone of the Bay of Bengal crossed a mountain range. Deflection or destruction is the fate of a cyclonic vortex approaching the hills of the coast regions of the Bay. The only case on record of a cyclone crossing the peninsula of India is that of the 22nd October 1842, which passed by the Palghat Gap, and was traced to 60° E. longitude in the Arabian Sea.
14. In the discussion of cyclones the antecedent favourable conditions and the source of the energy must be carefully distinguished. The invariable and necessary antecedents are—
 - (1) Approximate uniformity of pressure over the Bay.
 - (2) Light and variable winds over the central area of the Bay.
 - (3) No general rainfall for some time previously over the Bay and in India.
 The source of the energy is vapour condensation and rain precipitation, or, as stated in the Backergunge Cyclone Report, the primary cause of cyclone formation is "the production and ascent of a large quantity of vapour which is condensed with the liberation of its latent heat over the place of its production instead of being carried away to some distant region."
15. The air motion in cyclones is one of indraught, and therefore the wind direction at any point is not at right angles to the direction of the centre. The stream lines or the lines of air motion are spiral curves. The relation between the wind direction and the direction of the centre is probably not invariable, but depends upon the intensity of the storm or the baric gradient. The law laid down by Mr. Willson in the Report on the Midnapore Cyclone is probably the nearest approximation. It is "with the face of the wind, the direction of the centre is from ten to eleven point to the right hand side."

*The most complete account of these will be found in a small poetical description of the cyclones of the Bay of Bengal, published by J. R. Elson, Esq., Master Pilot, Calcutta.

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